

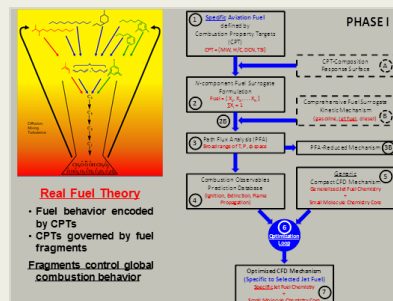
Compact Kinetic Mechanisms for Petroleum-Derived and Alternative Aviation Fuels, Phase I

Completed Technology Project (2014 - 2014)



Project Introduction

To be useful for computational combustor design and analysis using tools like the National Combustion Code (NCC), low-dimensional chemical kinetic mechanisms for modeling of real fuel combustion chemistry must be sufficiently compact so that they can be utilized in multi-dimensional, multi-physics, reacting computational fluid dynamics (CFD) simulations. Despite advances in CFD-appropriate kinetic mechanism reduction for kerosene-range fuels, significant combustion property variation among current and prospective certified fuels remains a challenge for meaningful CFD-advised design of high pressure, low-emissions combustors. The proposed project will leverage Princeton's ongoing work in aviation fuel surrogate formulation and modeling as well as kinetic mechanism development for emissions and high pressure combustion to produce and demonstrate a meta-model framework for automated generation of fuel-flexible compact chemical kinetic mechanisms appropriate for 3-D combustion CFD codes. Phase I will demonstrate the novel meta-model approach by providing compact kinetic mechanisms for both a "typical" Jet A/JP-8 (POSF-4658), as well as a synthetic paraffinic kerosene (SPK) derived from natural gas (POSF 4734). Phase II of this proposed work would generalize the Phase I results to span the combustion property parameter space relevant to both conventional and next-generation alternative aviation fuels. The commercial product foreseen from this SBIR program is a stand-alone, novice-friendly real fuel kinetic mechanism generator software package that can interface with commercially-available computational fluid dynamics (CFD) codes. Potential customers may include the companies supplying ANSYS, CFD-ACE+, or COMSOL, as well as industrial users with proprietary in-house codes. Tools to yield compact real fuel kinetic models has similar broad appeal for computational simulations in automotive, aerospace (both defense and civilian), and marine propulsion industries.



Compact Kinetic Mechanisms for Petroleum-Derived and Alternative Aviation Fuels Project Image

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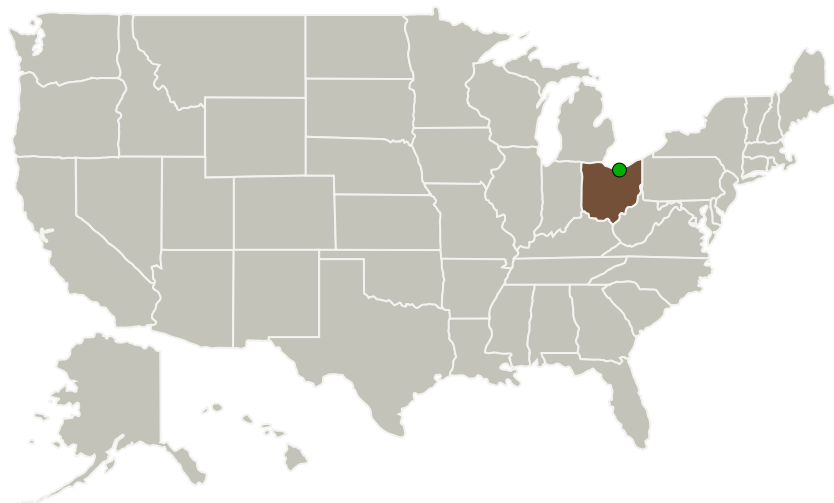
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Spectral Energies, LLC	Lead Organization	Industry Small Disadvantaged Business (SDB)	Dayton, Ohio
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Ohio

Project Transitions

**June 2014:** Project Start**December 2014:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/140508>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Spectral Energies, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Sivaram P Gogineni

Co-Investigator:

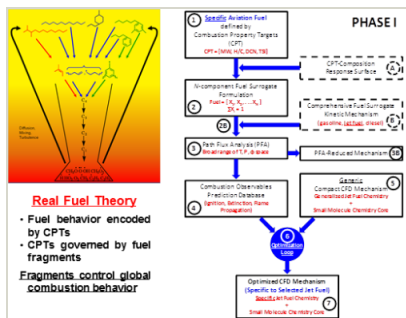
Sivaram Gogineni

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Images

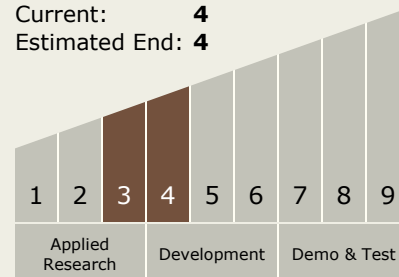


Project Image

Compact Kinetic Mechanisms for Petroleum-Derived and Alternative Aviation Fuels Project Image
(<https://techport.nasa.gov/image/130125>)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
 - TX11.1 Software Development, Engineering, and Integrity
 - TX11.1.8 Software Analysis and Design Tools

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System